

DOCUMENT RESUME

ED 200 828

CE 028 829

AUTHOR Thomas, Edward L., Comp.
TITLE Auto Mechanics. Module 1 of the Vocational Education Readiness Test (VERT).
INSTITUTION Mississippi Research and Curriculum Unit for Vocational and Technical Education, State College.; Mississippi State Dept. of Education, Jackson. Div. of Vocational and Technical Education.
PUB DATE 81
NOTE 47p.: Photographs will not reproduce well. For related documents see CE 028 828-836 and ED 159 455.
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Ability Identification; *Auto Mechanics; Competency Based Education; Disabilities; *Minimum Competencies; Occupational Tests; Performance; Psychomotor Skills; Secondary Education; Skill Analysis; Skill Development; *Testing; *Vocational Aptitude; *Vocational Education

ABSTRACT

Focusing on auto mechanics, this module is one of eight included in the Vocational Education Readiness Test (VERT). The module begins by listing the objectives of the module and describing tools and equipment needed. The remainder of the module contains sections on manipulative skills, trade vocabulary, tool identification, trade computational skills, and measuring skills depicted as minimum competencies students should possess prior to entrance into regular secondary vocational education programs. (A users guide is also available--see note.) (LRA)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED 200828

Module 1 of the Vocational Education Readiness Test (VERT)

AUTO MECHANICS

Compiled by:
Edward L. Thomas

Published by the:

Division of Vocational-Technical
Education
Mississippi State Department of
Education
Jackson, Mississippi

and

Research and Curriculum Unit
for Vocational-Technical Education
College of Education
Mississippi State University
Mississippi State, Mississippi

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

J. Skill

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

1981

CE 028 829

Direct inquiries to:
Research and Curriculum Unit
for
Vocational-Technical Education
College of Education
Drawer DX
Mississippi State, Mississippi 39762
Phone: (601) 325-2510

Mississippi State University does not discriminate on the basis of race, color, religion, national origin, sex, age, or handicap.

AUTO MECHANICS

Objective(s):

1. To determine student's ability to measure in inches, half-inches, quarter-inches and eighth-inches.
2. To determine student's ability to sort hexagonal nuts of differing size with the left hand and with the fingers of the left hand screw them on bolts grouped by size.
3. To determine student's ability to sort hexagonal nuts of differing size with the right hand and with the fingers of the right hand screw them on bolts randomly arranged.
4. To determine student's ability to match the proper wrench to hexagonal bolts of different sizes.
5. To determine student's ability to use a 1/2" open-end wrench and a 1/2" socket with ratchet while lying on the right shoulder.
6. To determine student's ability to use a 7/16" box-end wrench and 7/16" socket with ratchet while lying on the left shoulder.
7. To determine student's ability to use a 9/16" open-end wrench and a 9/16" socket with ratchet while lying on the back, face up.
8. To determine student's ability to use a 9/16" socket and ratchet with extension and a 9/16" box-end wrench while in the standing position.
9. To determine student's ability to remove and replace an automotive component by hand.
10. To determine student's ability to use a torque wrench.
11. To determine the student's ability to use both flatblade and Phillips screwdrivers.

Tools and Equipment Needed:

One size discrimination and finger dexterity kit which includes:

Six 1/2" x 2 1/2" hexagonal bolts

Twelve 3/8" x 2 1/2" hexagonal bolts

Four 5/16" x 1 1/2" hexagonal bolts

Twelve 5/16" x 2 1/2" hexagonal bolts

Twelve 1/4" x 2 1/2" hexagonal bolts

Note: See Appendix A for finger dexterity kit specifications.

One auto mechanics mock-up which includes:

One 7/16" combination (open-end/box-end) wrench

One 1/2" combination (open-end/box-end) wrench

One 9/16" combination (open-end/box-end) wrench

One 1/2" drive socket set including:

Sockets

One 7/16"

One 1/2"

One 9/16"

Fittings

One reversible ratchet

One extension

One flatblade 1/4" screwdriver

One Phillips 1/4" screwdriver

One 1/2" drive direct reading scale torque wrench -(Inch-Pounds)

Two slotted roundhead stove bolts 1/4" - 2"

Two Phillips head stove bolts 1/4" - 1 1/4"

12" plastic ruler

Note: See Appendix B and Appendix C for Auto Mechanics Mock-up Specifications.

Preliminary Exercise:

The evaluator will identify a 12" plastic rule and demonstrate how to measure to the nearest inch, half-inch, quarter-inch, and eighth-inch. Answer any questions at this time; however, avoid "teaching" the student to measure by giving repeated demonstrations. (See Figure 1.)

Special Instructions: Lines for Tasks 1 - 4 should measure 3", 3 1/2", 3 1/4", and 3 1/8", respectively, and should be drawn on a separate sheet of paper.



Figure 1.

- Task 1: _____ *
- Task 2: _____ *
- Task 3: _____ *
- Task 4: _____ *

Tasks 1 through 4

Given a 12" plastic rule and measuring tasks 1, 2, 3, and 4, the student will measure the line in each task and tell his/her findings to the evaluator.

*Lines are drawn on separate sheet to respective length by evaluator.

Preliminary Exercise:

The evaluator will demonstrate, with the left hand, how to sort the nuts in section 1 of the kit and screw the nuts on the bolts. (See Figure 2.)

Special Instructions: Prior to beginning task #5, place all nuts flat in the bin of section 1 of the kit. Do not permit the student to practice!

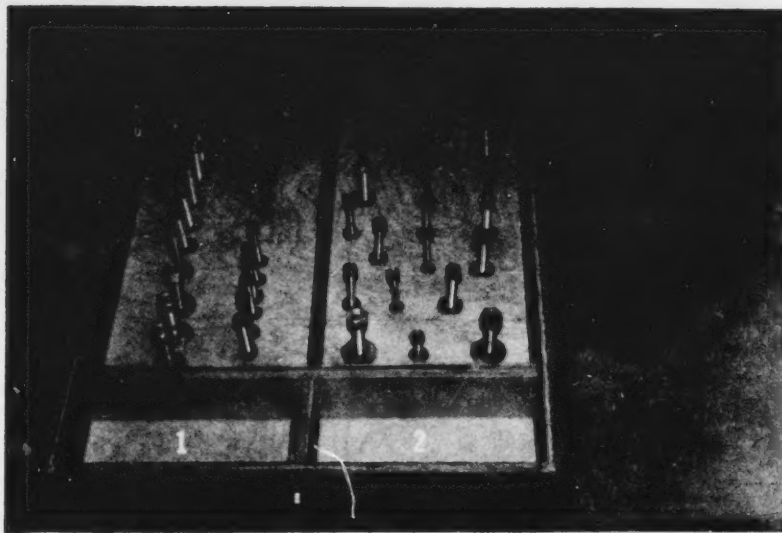


Figure 2.

Task 5

Given the size discrimination and finger dexterity kit, the student will select nuts by size from the largest to the smallest and with left hand screw them on the bolts in section 1 until they are even with the top. **Note time!**

Preliminary Exercise:

The evaluator will demonstrate, with the right hand, how to sort the nuts in section 2 of the kit and screw the nuts on the bolts. (See Figure 3.)

Special Instructions: Prior to beginning task #6, place all nuts flat in the bin of section 2 of the kit. Do not permit the student to practice!



Figure 3.

Task 6

Given the size discrimination and finger dexterity kit, the student will select nuts by size from the largest to the smallest and with the right hand screw them on the bolts in section 2 until they are even with the top. **Note time!**

Preliminary Exercise:

The evaluator will demonstrate how to match one wrench with its matching bolt. Once the two have been matched, they will be placed away from the remainder of the bolts and wrenches. (See Figure 4.)

Special Instructions: The four bolts will be placed on the table in order from smallest to largest (left to right). The four wrenches will be in a randomly arranged group.

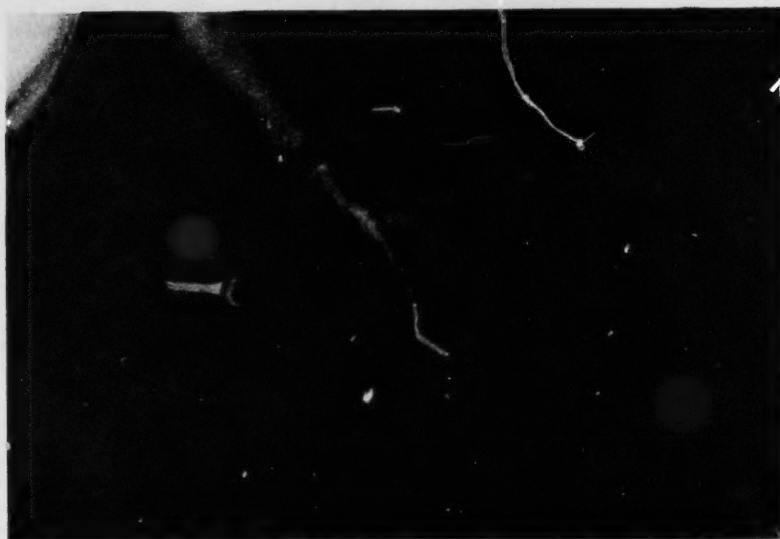


Figure 4.

Task 7

Given four combination wrenches and four hexagonal bolts, the student will select the proper wrench for each bolt. **Note time!**

Preliminary Exercise:

The evaluator will identify the 1/2" open-end wrench, and the 1/2" sprocket, and ratchet to be used. The evaluator will then demonstrate how to remove and replace an automotive water pump. (See Figure 5.)

Special Instructions: The evaluator will demonstrate how to reverse the ratchet but leave it set for student to begin the task. Instruct student to tighten the bolts only to the degree that they cannot be loosened with the fingers. Instruct student to completely remove the water pump from the mock-up, place it on the floor with all bolts removed, and then replace it. Have student attach socket and extension as part of this task. In addition, the evaluator should demonstrate the correct body position to be used for removal of the water pump.



Figure 5.

Task 8

Given the auto mechanics mock-up, the student will remove and replace the water pump using the 1/2" open-end wrench and the 1/2" socket with ratchet and extension while lying on the right shoulder. **Note time!**

Preliminary Exercise:

The evaluator will identify the 7/16" box-end wrench, and the 7/16" socket and ratchet to be used. The evaluator will then demonstrate the proper body position and instruct the student to mount the automotive blower motor on the mock-up just as shown in the picture. (See Figure 6.)

Special Instructions: The evaluator should demonstrate the correct body position to be used for mounting the blower motor. Student may use picture attached to the side of the mock-up as a guide.



Figure 6.

Task 9

Given the auto mechanics mock-up, the student will mount the blower motor using the 7/16" box-end wrench and 7/16" socket and ratchet while lying on the left shoulder. **Note time!**

Preliminary Exercise:

The evaluator will identify the 9/16" open-end wrench and the 9/16" socket and ratchet to be used. The evaluator will then demonstrate how to remove and replace the brake master cylinder. (See Figure 7.)

Special Instructions: The evaluator should demonstrate the desired body position for mounting the master cylinder.



Figure 7.

Task 10

Given the auto mechanics mock-up, the student will remove and replace the brake master cylinder using the 9/16" open-end wrench on the top and the 9/16" socket with ratchet on the bottom while lying on the back, face up. **Note time!**

Preliminary Exercise:

The evaluator will identify the 9/16" box-end wrench, the 9/16" socket and ratchet and extension, and demonstrate how to assemble the extension, socket, and ratchet. The evaluator will then demonstrate how to remove and replace the fuel pump. (See Figure 8.)

Special Instructions: Instruct the student to begin nuts with fingers.

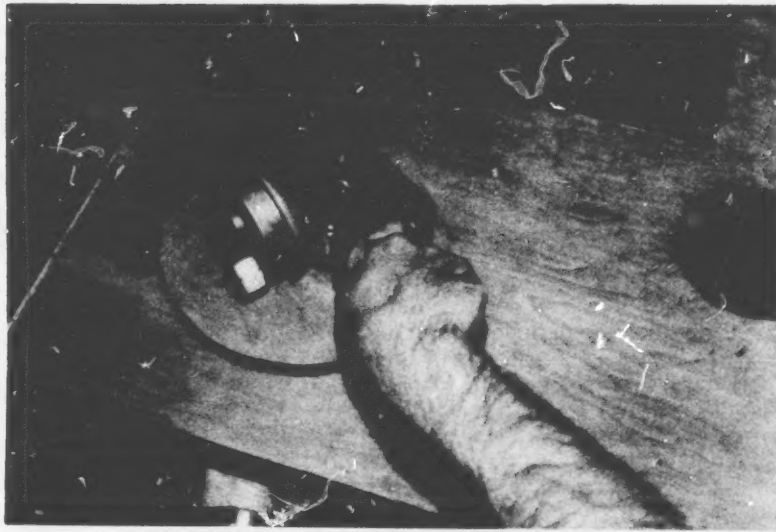


Figure 8.

Task 11

Given the auto mechanics mock-up, the student will remove and replace the fuel pump using the 9/16" socket, ratchet, and extension on the top and the 9/16" box-end wrench on the bottom while in the stooping position. **Note time!**

Preliminary Exercise:

The evaluator will demonstrate how to remove and replace the carburetor by using only the hands and fingers. (See Figure 9.)

Special Instructions: *Inform the student that each bolt should be replaced in its original hole.*



Figure 9.

Task 12

Given the auto mechanics mock-up, the student will remove and replace the carburetor using only the hands and fingers while kneeling on one knee. **Note time!**

Preliminary Exercise:

The evaluator will demonstrate how to properly torque one nut of the carburetor to 10-inch-pounds. (See Figure 10.)

Special Instructions: Caution the student not to over-pull as this may damage the mock-up.



Figure 10.

Task 13

Given the auto mechanics mock-up, the student will torque the four nuts of the carburetor to 10-inch-pounds with a tolerance of + or - 5 inch-pounds. **Note time!**

Preliminary Exercise:

The evaluator will demonstrate how to screw both types of stove bolts into nuts mounted on the mock-up. (See Figure 11.)

Special Instructions: Do not tighten the stove bolts!

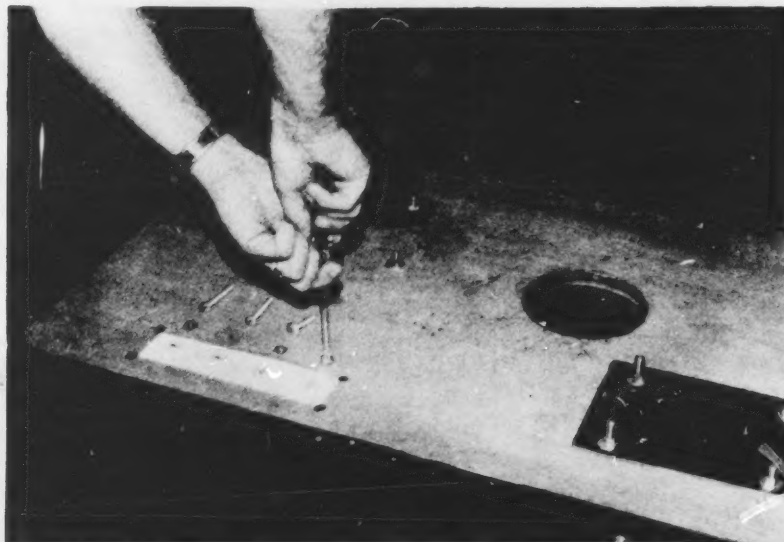


Figure 11.

Task 14

Given the auto mechanics mock-up, stove bolts, flatblade and Phillips screwdrivers, the student will screw the bolts into the mock-up until the head of the bolts are touching the nuts. **Note time!**

VOCATIONAL EDUCATION READINESS TEST (VERT)
SCORING RESULTS SHEET FOR AUTO MECHANICS

(Example Only)

Name _____

Student Performance Data

Time*					
Acceptable	Unacceptable				
		**Cut-Off Time (Seconds)			
Task 1	_____	_____	(1/2")	X	Measurement Skills
Task 2	_____	_____	(1/4")	X	
Task 3	_____	_____	(1/8")	X	
Task 4	_____	_____	(1/16")	X	
Task 5	_____	_____	210		
Task 6	_____	_____	160		
Task 7	_____	_____	22		
Task 8	_____	_____	1150		
Task 9	_____	_____	390		
Task 10	_____	_____	380		
Task 11	_____	_____	360		
Task 12	_____	_____	155		
Task 13	_____	_____	295		
Task 14	_____	_____	210		

*Write N/C should student be unable to complete the task.

**These scores were arbitrarily identified and included for demonstration purposes only.

VOCABULARY FOR AUTO MECHANICS

ADDITIVE: A product which can be added to oil or gasoline to improve engine performance.

AIR BLEED PORT: An opening in a fuel or brake line through which air can exit.

AIR CLEANER: A device mounted on the carburetor to filter dirt from air going into the engine.

AIR CONDITIONING: A refrigeration system which cools air going into the passenger compartment.

AIR TOOL: A hand-held tool powered by air.

ALTERNATING CURRENT: An electric current that flows first in one direction then in the other direction.

ALTERNATOR: An electrical generating device that produces alternating current.

ANTI FREEZE: A chemical added to the radiator water to lower its freezing point.

AXLE: A supporting shaft upon which a wheel or wheels rotate.

BATTERY: A device for storing electrical current.

BEARING: A part which transmits the load to the axle and reduces friction between moving parts in contact with each other.

BELTED-RADIAL TIRE: A tire in which the plies run parallel to each other from bead to bead. Over these plies, fiberglass or steel belts are laid which run in the same direction as the tire tread.

BIAS-PLY TIRE: A tire in which the plies are crisscrossing each other at an angle of about 30 degrees from the bead.

BLOW-BY: Unburned fuel mixture leaking past the piston rings during the compression and combustion strokes.

BORE: The diameter (width) of an engine cylinder.

BRAKE: A device used to stop or hold a wheel or mechanism.

BRAKE FLUID: A fluid used in a hydraulic braking system.

BRAKE SHOE: An arc shaped part lined with a high friction material. The shoe is pressed against the inside (drum) of a revolving wheel to slow or stop the wheel.

BRUSH: A block of carbon, etc. which rests against the commutator in an electric motor to form an electrical circuit.

CAMSHAFT: The engine shaft which operates engine valves.

CARBON DIOXIDE: A colorless, odorless gas which is produced when gasoline is completely burned.

CARBON MONOXIDE: A colorless, odorless, tasteless and poisonous gas which is produced when gasoline is **not** burned completely.

CARBURETOR: The air-fuel mixing device for an engine.

CATALYTIC CONVERTER: A device fitted into an exhaust system to change harmful gases into harmless gases by a chemical reaction.

CHOKE: A part in the carburetor used to deliver a richer fuel mixture to the engine.

CIRCUIT BREAKER: A protective device that opens an electrical circuit to prevent damage due to excess current flow.

CLUTCH: The part of an auto that connects and disconnects the engine to the transmission.

COMBUSTION: The rapid burning of a fuel-air mixture in the cylinder.

COMPRESSION: Pressure developed in an engine cylinder while cranking.

CONDENSER: A storage place for electricity in the ignition system.

COOLING SYSTEM: The system that removes heat by circulating water, etc. under pressure through the engine.

CRANKSHAFT: The main rotating shaft of an engine to which connecting rods are attached.

CYLINDER BLOCK: The basic framework of an engine on which other engine parts are attached.

CYLINDER HEAD: The part of an engine that enclosed the cylinders and which contains sparkplugs, water jackets, and valves.

DETERGENT: A chemical added to engine oil to help keep parts of the engine clean by removing deposits, etc.

DIESEL ENGINE: An engine operating on the diesel cycle and burning diesel oil instead of gasoline.

DIFFERENTIAL: A mechanism between the axles to the rear wheels that permits one wheel to turn at a different speed than the other.

DISPLACEMENT: The total volume in the cylinders of an engine which is used by pistons moving from one end of a stroke to the other.

DROP LIGHT: A portable light, with a long electric cord, used in a shop to light a work area.

ELECTROLYTE: The mixture of sulfuric acid and water used in lead-acid storage batteries.

ENERGY: The ability to do work—usually measured in horsepower.

EVAPORATOR: The device in an airconditioner in which a refrigeration gas evaporates to absorb heat from the air.

FIRING ORDER: The order in which the sparkplugs fire into the cylinders to deliver the power stroke.

FLAT RATE: Method of paying mechanics based on the use of a job-time manual.

FLOOR JACK: A portable hydraulic lifting device to raise a vehicle, etc. for repairs underneath.

FLYWHEEL: A metal wheel fitted to the back of the crankshaft to help smooth the engine's operation and also serves as a part of the clutch.

FRICTION: The resistance to motion between two objects in contact with each other.

FUEL FILTER: A device placed in the fuel line to filter water and dirt from the fuel before it enters the carburetor.

FUEL PUMP: A mechanical pump in the fuel system which pumps fuel from the fuel tank to the carburetor.

FUSE: A device in the electrical system which protects against excessive current flow. It burns out before the circuit is damaged.

GASKET: A flat strip of material, fabric or metal, which is placed between two parts to provide a tight seal.

GEAR RATIO: The speed at which two different size gears turn while in contact with each other. Should gear #1 turn three revolutions while gear #2 turns one revolution the gear ratio is 3:1.

GENERATOR: A device that converts mechanical energy obtained from a belt or shaft into electrical energy.

GRINDER: A machine for removing metal, etc. by using an abrasive wheel or stone.

GROUND: Connecting an electrical unit (motor, light, etc.) to the engine or frame so that electrical current can return to its source.

H²O: Chemical symbol for water.

HORSEPOWER: A method of measuring how much work or the rate at which work is done.

HYDROCARBON: A compound made of hydrogen and carbon. Diesel fuel, gasoline, etc. are mixtures of hydrocarbons from crude oil.

IGNITION COIL: The ignition part that serves as a step-up transformer to raise battery voltage to several thousand volts so that spark plugs will fire.

INSULATION: Materials or covering on wires that will prevent the flow of electricity outside the wire. Likewise, fiberglass, cellulose, etc. insulation will stop heat buildup in a house or auto.

INTERNAL COMBUSTION ENGINE: An engine in which the fuel is burned inside the engine.

KILOGRAM: A unit of weight in the metric system equal to approximately 2.2 pounds.

KILOMETER: A unit of measure (distance) in the metric system equal to .621 miles.

LITER: A measure of volume in the metric system equal to 1.06 quarts.

MASTER CYLINDER: A liquid-filled cylinder in the hydraulic braking system which develops hydraulic pressure as a foot pedal is depressed.

MICROMETER: A precision measuring device that measures small distances.

MUFFLER: A part of the exhaust system which muffles sound as exhaust gasses and noise pass through it.

NUT: A removable fastener that locks pieces together on a bolt.

OCTANE RATING: A measure of antiknock properties of a fuel.

OHC ENGINE: An engine in which the camshaft is located in the cylinder head instead of the block.

OIL FILTER: The filter through which engine oil passes to remove impurities.

PARKING BRAKE: Non-hydraulic brakes which operate separate from the regular brakes and can be set for vehicle parking.

PCV: Positive crankcase ventilation.

POWER TOOL: A tool that uses a power other than muscle power.

RADIATOR: In the cooling system, the device that removes heat from the water moving through it.

REFRIGERANT: A substance used in an air conditioner to produce a cooling effect through evaporation and condensation.

SHOCK ABSORBER: A device placed at each wheel to absorb excessive spring motion.

SHORT CIRCUIT: A defect in an electrical circuit that permits current to take a short path instead of the intended path.

SMOG: A term used to describe any condition of dirty air, and/or fumes or smoke.

SPARK PLUG: A part which fires electrical current into an engine's cylinder.

SPECIFICATIONS: The measurements recommended by the manufacturer for the vehicle being serviced.

SPRING: A metal device which yields under pressure, but returns to its original position after the pressure is removed.

STARTER: The electric motor that turns the engine's crankshaft for starting.

STEERING SYSTEM: The mechanism that enables a driver to turn the wheels to change the direction a vehicle is moving.

STROKE: The distance a piston moves from top to bottom of the cylinder.

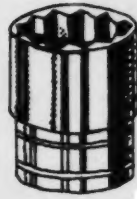
TACHOMETER: A device for measuring engine speed.

THERMOSTAT: A device that regulates temperature.

THROTTLE: A valve in the carburetor that permits the driver to vary the amount of fuel/air mixture entering the engine, thus controlling engine speed.

TORQUE: The amount of turning or twisting effort an engine develops.

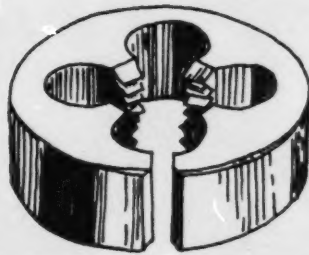
Tools for Auto Mechanics



STANDARD SOCKET



DEEP SOCKET



THREAD DIE



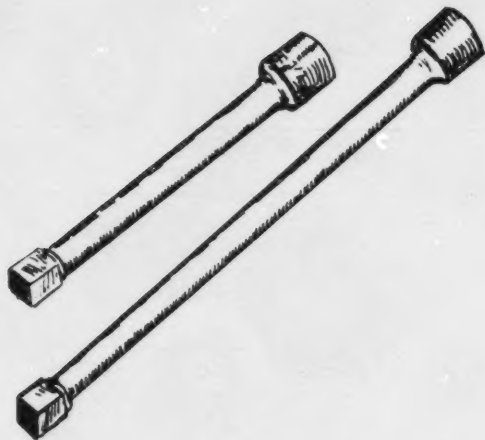
BACKOUT TOOL



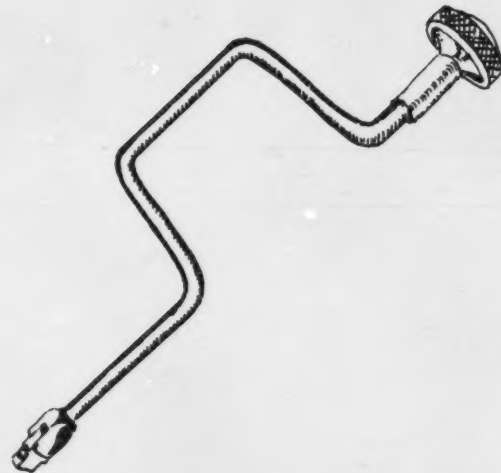
SIDE-CUTTING PLIERS



AIR IMPACT WRENCH



EXTENSIONS



SPEED HANDLE



SLEDGE HAMMER



LUG WRENCH



PULL HANDLE



HOSE CLAMP PLIERS



FEELER GAUGES



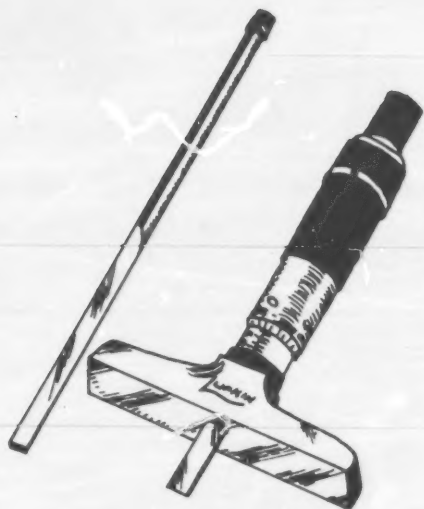
BURNISHING TOOL



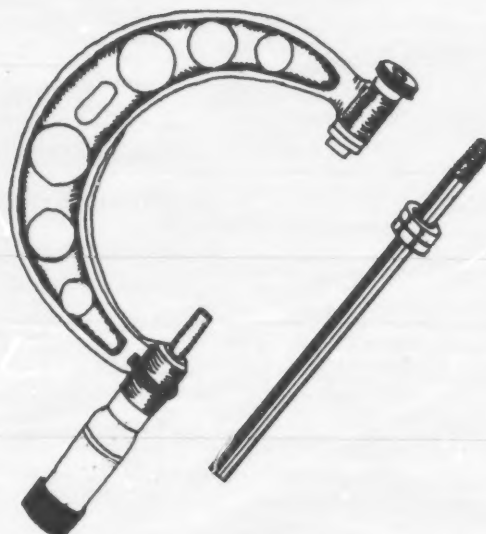
STRAIGHT REAMER



STRAIGHT SNIPS



**DEPTH GAUGE
MICROMETER**



MICROMETER



**STANDARD
SOLDERING IRON**



**RAWHIDE
FACED HAMMER**



RATCHET HANDLE



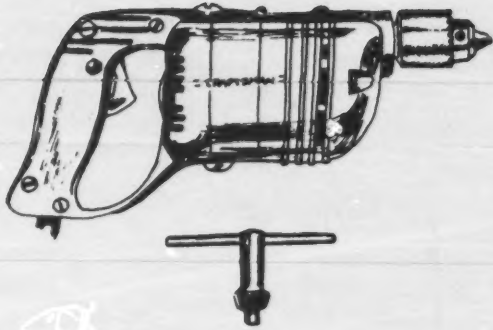
ROUNDNOSE PLIERS



TORQUE WRENCH



RATCHET BOX WRENCH



**ELECTRIC
DRILL AND KEY**



**FLATBLADE
SCREWDRIVER**



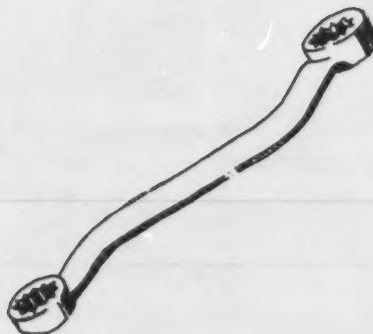
**PHILLIPS
SCREWDRIVER**



STEEL TWIST BIT



T-SOCKET WRENCH



BOX-END WRENCH



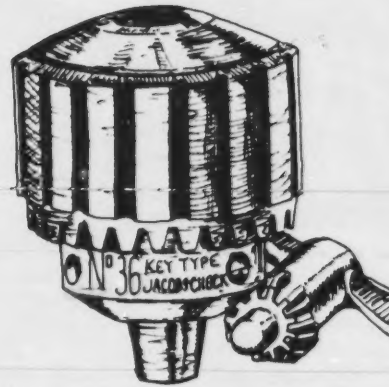
OPEN-END WRENCH



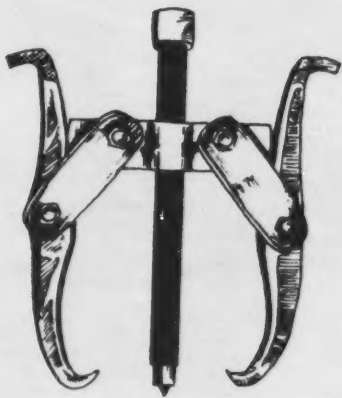
**ALLEN WRENCH
(HEX)**



SCRIBER



DRILL CHUCK AND KEY



GEAR PULLER



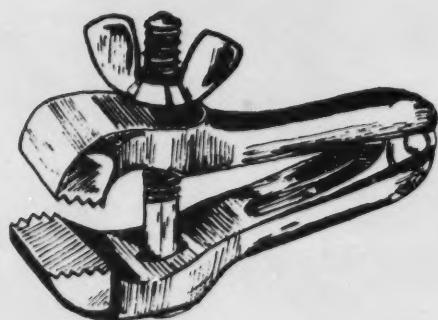
SAFETY GOGGLES



THREADING TAP



ADJUSTABLE WRENCH



HAND VISE



ELECTRICIAN'S PLIERS



WISE GRIP PLIERS



CENTER PUNCH



HACKSAW



OFFSET SCREWDRIVER



BALL PEEN HAMMER



RUBBER Mallet



SLIP JOINT PLIERS



CHANNEL-LOCK PLIERS



COLD CHISEL



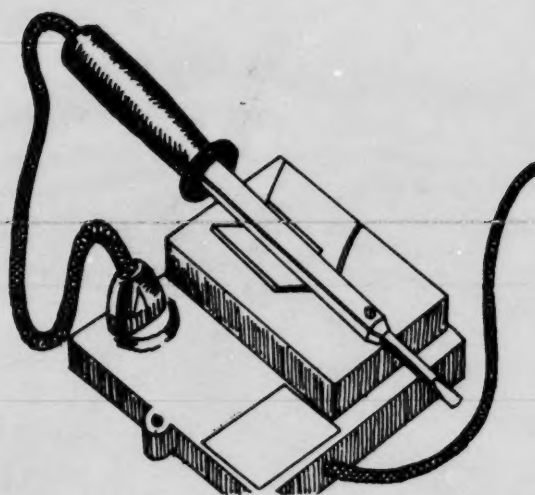
HAND DRILL



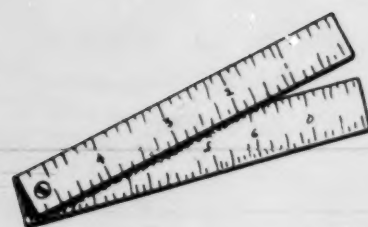
ROUND MILL FILE



FLAT MILL FILE



**ELECTRIC
SOLDERING IRON**



STEEL RULE



PIN PUNCH

COMPUTATIONAL SKILLS FOR Auto Mechanics

Addition:

$1 \frac{1}{3}$	$2 \frac{3}{4}$	$4 \frac{7}{8}$	$5 \frac{1}{2}$	$3 \frac{1}{2}$	$19 \frac{7}{16}$	$46 \frac{1}{8}$
$+2 \frac{2}{3}$	$3 \frac{1}{2}$	$6 \frac{7}{8}$	$6 \frac{1}{4}$	$9 \frac{1}{2}$	$17 \frac{3}{16}$	$55 \frac{3}{8}$

123	2,320	12.88	1.67	.06	.92	56
56	199	11.22	.09	.07	.09	43
						7
						19

132		
88	$\frac{1}{2}$	$11 \frac{5}{16}$
11	$\frac{3}{4}$	$6 \frac{1}{4}$
121	$\frac{1}{3}$	$3 \frac{3}{8}$

Subtraction:

18	10.3	$11 \frac{1}{2}$	$8 \frac{3}{8}$	$22 \frac{3}{4}$	$13 \frac{11}{16}$
-7	6.8	$3 \frac{1}{4}$	$4 \frac{5}{8}$	$6 \frac{1}{2}$	$2 \frac{3}{16}$

$\frac{1}{67}$	.92	23.04	16.50	112.62	110.17
.09	.09	3.97	8.51	99.73	109.79

Multiplication:

$15 \times 3 =$

$2.3 \times 6.8 =$

$1/4 \times 1/2 =$

$22 \times 22 =$

$9.9 \times 13.4 =$

$8 \times 9.5 =$

$11 \times 110 =$

$11.5 \times 16 =$

$12 \times 11 =$

Division:

$4 \div 2 =$

$129.6 \div 10 =$

$25.5 \div 5 =$

$16 \div 2 =$

$44 \div 12 =$

$25.5 \div 15 =$

$36 \div 6 =$

$116 \div 36 =$

$1080 \div 33 =$

Reading Problems

1. Book rate (labor charge) for replacing a master cylinder on a 1977 1/2 ton Ford Pickup is \$21.00. The master cylinder cost \$34.00 and brake fluid cost \$1.00. What was the total cost of the repair job?
2. Your shop manual lists specifications for a particular front-end repair job to be 3 1/2 degrees. Does this mean 3 degrees and thirty minutes? Explain.
3. You can easily change fractions to decimals. For example, $1/8 = .125$ or one hundred twenty-five thousandth of an inch. Simply divide the top number (1) by the bottom number (8) i.e.

i.e.

$$\begin{array}{r}
 .125 \\
 8 \overline{) 1.00} \\
 \underline{8} \\
 20 \\
 \underline{16} \\
 40
 \end{array}$$

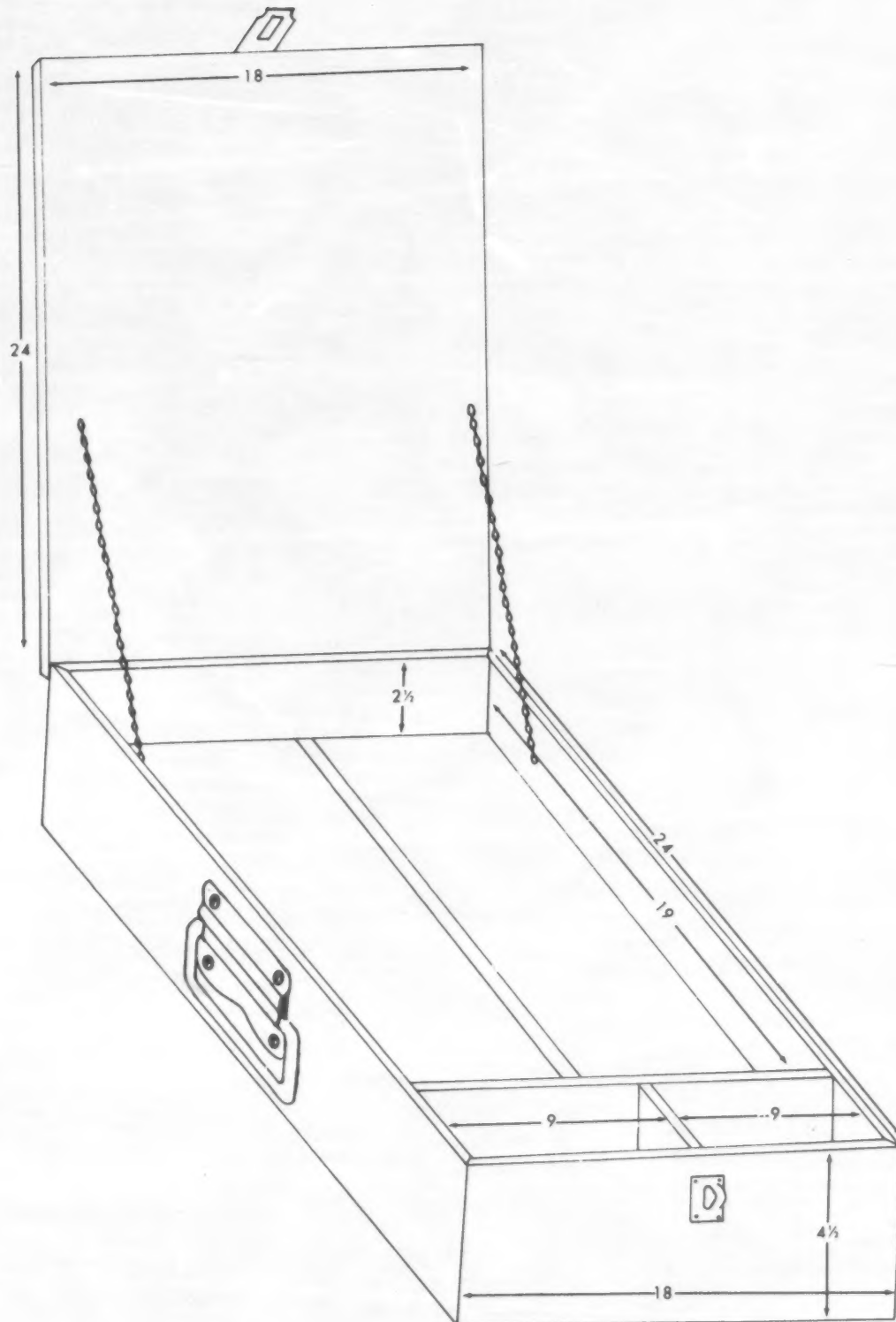
- a. Change 3/16 to decimals.
- b. Change 1/4 to decimals.
- c. Change 1/2 to decimals.
- d. Change 5/32 to decimals.

4. An air cleaner bolt must be at least .75 inches long but no longer than .91 inches. Will a 15/16 inch bolt work?
5. If both intake and exhaust valves for each cylinder in a 6 cylinder engine can be reconditioned in 3 hours, how long will it take to recondition each valve?
6. Your shop supervisor tells you to order enough wheel and bearing grease for 20 work days. You use about 1 1/2 cans of grease per day, thus, how many would you order ?
7. The rear axle ratio of a certain GM automobile is 2.41. You are instructed to replace the above axle with a 3.25 ratio axle.

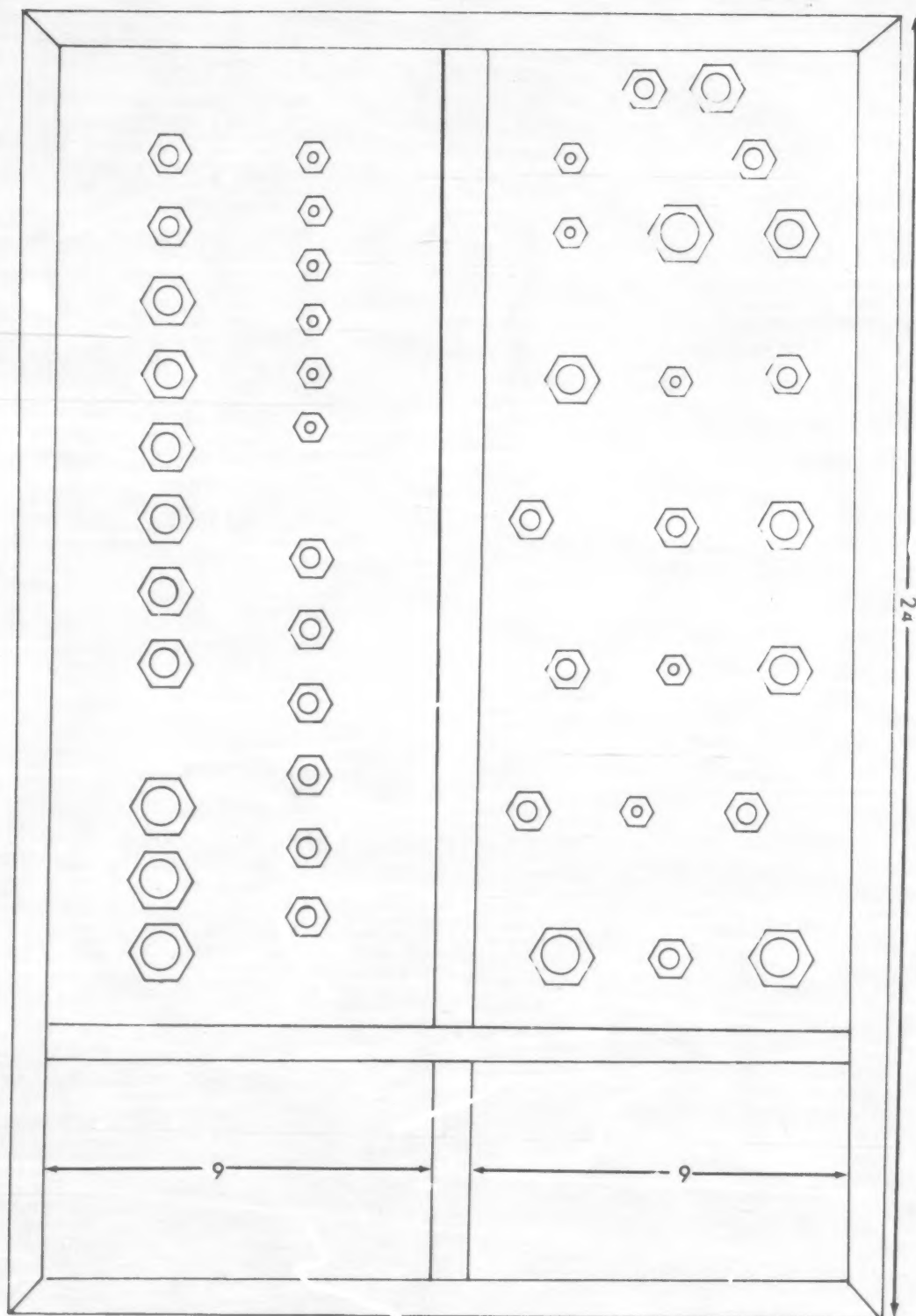
Circle One Answer

- | | | |
|--|-----|----|
| a. The automobile will now have more power. | Yes | No |
| b. The automobile will use more fuel. | Yes | No |
| c. At 50 MPH the engine will turn a higher RPM with the 3.25 axle then with the 2.41 axle. | Yes | No |

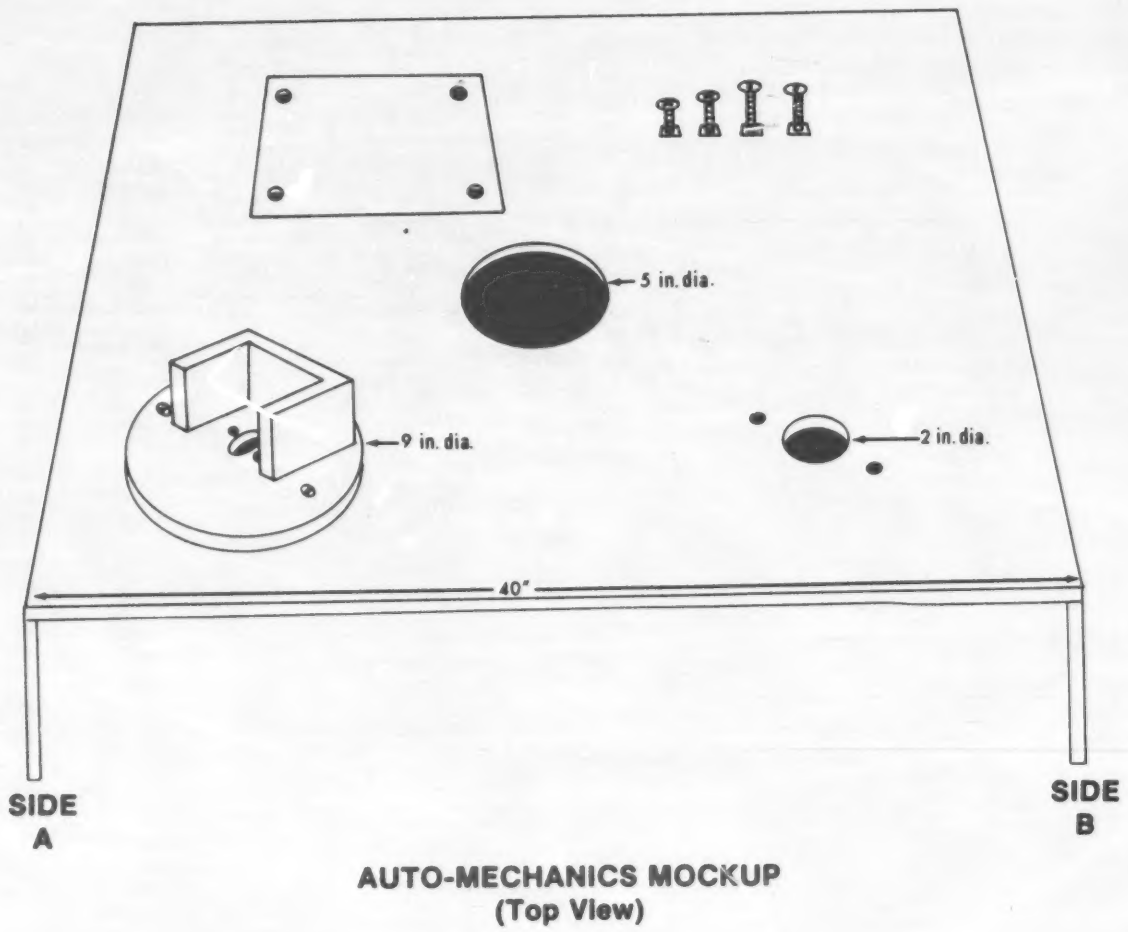
APPENDIX A
FINGER DEXTERITY KIT

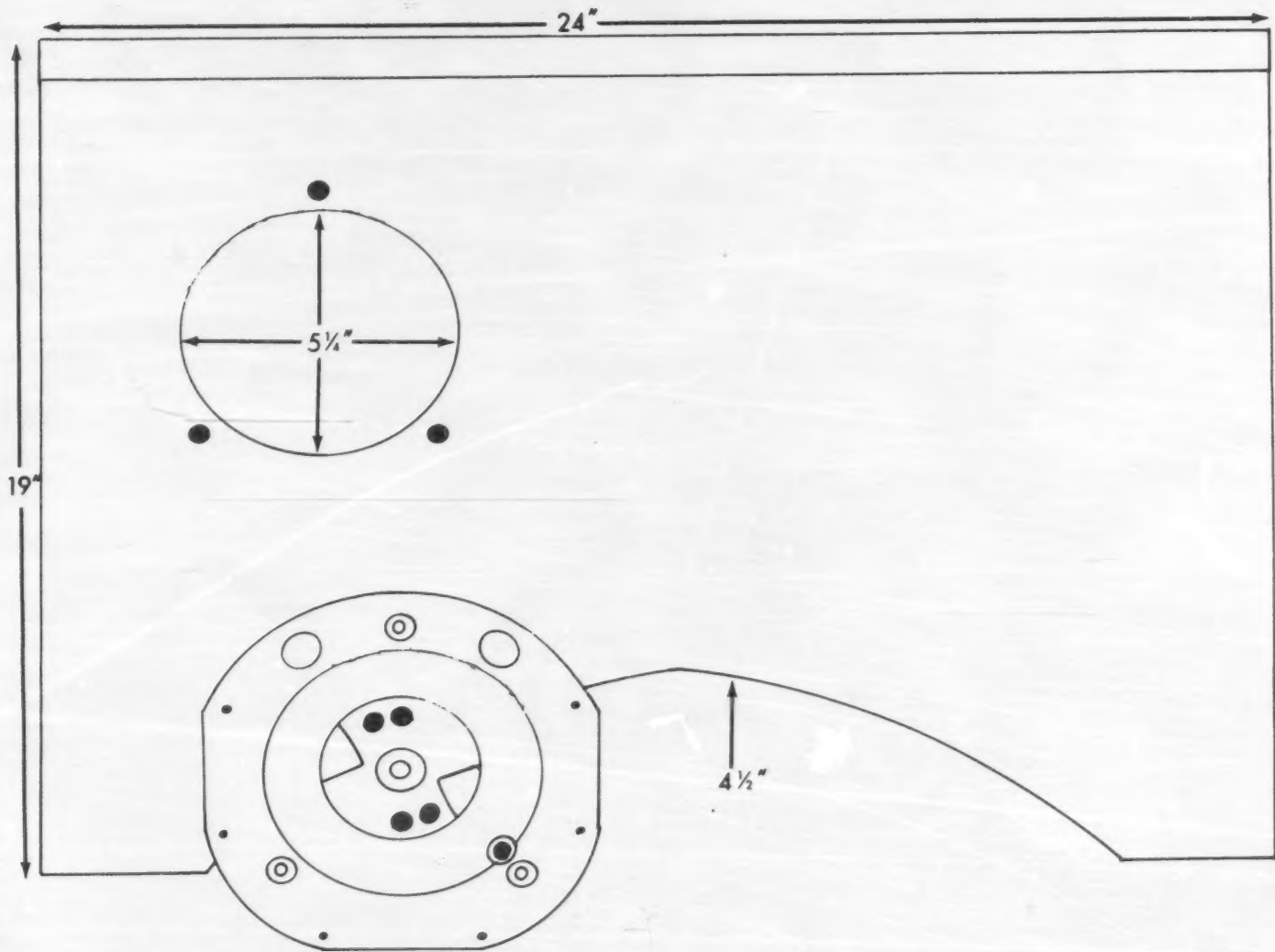


(Inside View)



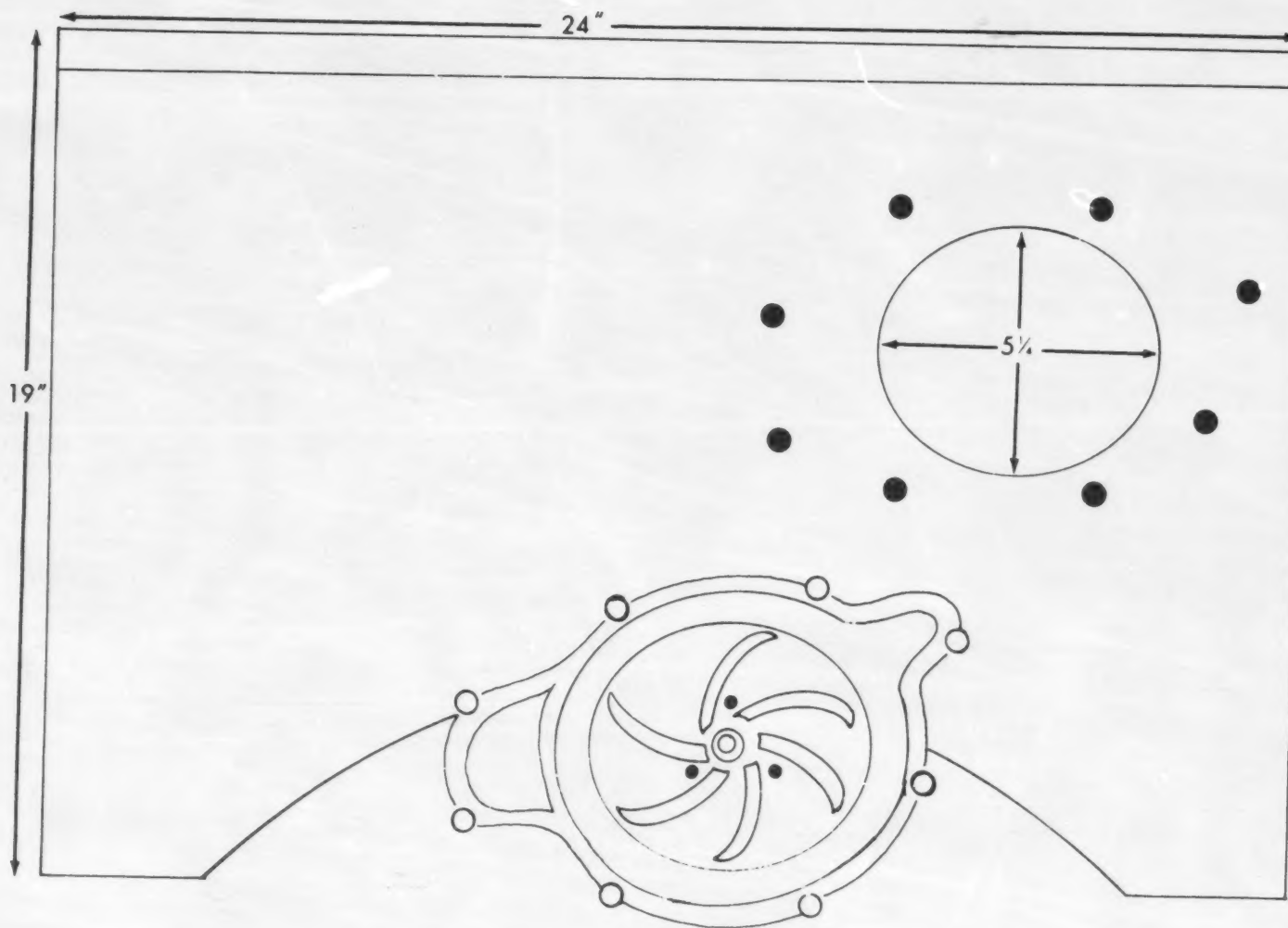
APPENDIX B





SIDE A VIEW OF AUTO-MECHANICS MOCKUP

45



SIDE B VIEW OF AUTO-MECHANICS MOCKUP

46

47